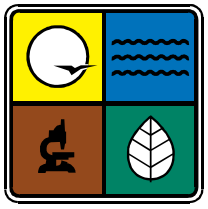

Missouri Department of Natural Resources
Water Protection Program

Public Notice
January 30, 2004

Request for Comment on Proposed Water Body Classification Evaluation Procedures

The Missouri Department of Natural Resources requests any interested party to comment on the procedures proposed by the department to determine water body classification under Missouri's Water Quality Standards, 10 CSR 20-7.031. This document describes how the department proposes to determine if specific waters in Missouri meet the definition of a classified stream, lake or wetland. The Department will receive such comments until 5:00 PM, February 29, 2004. A copy of this proposal is available on the program's Web site at http://www.dnr.mo.gov/wpscd/wpcp/index.html. The list of current classified waters is given in Missouri's Water Quality Standards document and can be found at the following Web site: http://www.sos.mo.gov/adrules/csr/current/10csr/10c20-7a.pdf.

Proper classification of waters of the state is very important. Failure to classify waters that should be classified represents a failure to adequately protect waters valuable as aquatic habitat and possibly other beneficial uses. Erroneously assigning a classification to unclassified waters may impose additional costs for wastewater treatment or other management measures that provide no net environmental benefit.

Only written comments will be accepted. Written comments may be submitted by letter, fax or email. Letters should be addressed to: Attn. John Ford, Water Pollution Branch, Water Protection Program, Missouri Dept. of Natural Resources, PO Box 176, Jefferson City, MO 65102. Send fax messages to: John Ford 573/526-5797. Send email comments to john.ford@dnr.mo.gov.

Water Body Classification Evaluation Procedures

1. Background

The Missouri Clean Water Law (Chapter 644 RSMo) and the surface water quality standards (10 CSR 20-7.031) establish water quality goals for all waters of the state. Waters of the state are defined as

> *All rivers, streams, lakes, and other bodies of surface and subsurface water lying within or forming a part of the boundaries of the state which are not entirely confined and located completely upon lands owned, leased, or otherwise controlled by a single person or by two or more persons jointly or as tenants in common and includes waters of the United States lying within the state.*

Classified waters are an important subset of the waters of the state as they are required to meet specified beneficial uses and are subject to numeric water quality criteria designed to protect those uses. The procedures discussed in this document are intended to provide guidance for staff to use in developing recommendations regarding the proper classification of the state's waters. Any change to a water's classification along with any additions to the list of classified waters will be done through the state's rulemaking procedure.

2. Water body Classifications

Water body classifications are given in 10 CSR 20-7.031(1)(F) as follows:

Classified waters—All waters listed as L1, L2 and L3 in Table G and P, P1 and C in Table H. During normal flow periods, some rivers back water into tributaries, which are not otherwise classified. These permanent backwater areas are considered to have the same classification as the water body into which the tributary flows.

1. *Class L1—Lakes used primarily for public drinking water supply.*
2. *Class L2—Major reservoirs.*
3. *Class L3—Other lakes, which are waters of the state. These include both public and private lakes. For effluent regulation purposes, publicly owned L3 lakes are those for which a substantial portion of the surrounding lands are publicly owned or managed.*
4. *Class P—Streams that maintain permanent flow even in drought periods.* [1]
5. *Class P1—Standing-water reaches of Class P streams.*
6. *Class C—Streams that may cease flow in dry periods but maintain permanent pools which support aquatic life.*
7. *Class W—Wetlands that are waters of the state that meet the criteria in the* Corps of Engineers Wetlands Delineation Manual *(January 1987), and subsequent federal revisions. Class W waters do not include wetlands that are artificially created on dry land and maintained for the treatment of mine drainage, stormwater control, drainage*

[1] Class P and C streams were originally taken from a Department of Conservation publication, "Missouri Fishing Streams" D-J Series No. 5. Published in 1968, the author was John Funk. The publication lists streams by name and gives segment lengths for permanently flowing portions and segments with fishable pools. The report notes the original data were observations made during prolonged dry periods in the 1930s and says that many of these streams were re-visited during a dry period in the 1950s and these observations compared well with those made in the 1930s.

associated with road construction, or industrial, municipal or agricultural waste. Class W determination on any specific site shall be consistent with federal law.

3. Guidelines for Lake Classification

Guideline 3.1. L1 Lake: Lake meets the definition of 'waters of the state,' serves as a public drinking water supply source and the surface area at full pool is less than 1500 acres.

Guideline 3.2. L2 Lake: Lake meets the definition of 'waters of the state,' full pool area is 1500 acres or more in size and lake maintains more than 15% of its full pool area throughout the year in three out of four years.

Guideline 3.3. L3 Lake: Lake meets the definition of 'waters of the state,' full pool area is less than1500 acres in size and lake maintains more than 15% of its full pool area throughout the year in three out of four years.

Note: The current lake classification is inconsistent with regard to area. For example, Clearwater Lake is currently an L2 lake of 1,650 acres while Silver Lake is an L3 lake of 2,464 acres.

Note: Several waters currently classified as L3 lakes such as the pools within Squaw Creek National Wildlife Refuge (NWR), Swan Lake NWR and Ten Mile Pond in Mississippi County are very large but shallow lakes that are totally de-watered or nearly so at least once every two or three years. These waters would not meet the 15% full pool guideline in three years out of four and will be proposed to be deleted from the list of classified lakes and added as classified wetlands, Class W in a future rulemaking.

Public vs. Private L3 Lakes

Missouri's Effluent Regulation, 10 CSR 20-7.015, distinguishes between public and private L3 lakes with regard to effluent limits. At 10 CSR 20-7.015(3) it prescribes a minimum effluent limit of 20 mg/L BOD and 20 mg/L NFR for "..a lake or reservoir designated in 10 CSR 20-7.031 as L2 or L3 which is publicly owned" and assigns treatment limits (less stringent than 20 BOD, 20 NFR) given at 10 CSR 20-7.015(8) for discharges to private lakes.

In its definitions, State Water Quality Standards, 10 CSR 20-7.031(1)(F), state in part "*..Class L3--Other lakes, which are waters of the state. These include both public and private lakes. For effluent regulation purposes, publicly owned L3 lakes are those for which a substantial portion of the surrounding lands are publicly owned or managed."* Thus, the Water Quality Standards appear to distinguish between public and private lakes in this definition but in no other part of the Standards are individual lakes identified as public or private.

The hydrology, water chemistry and response to pollutant discharges are the same in public and private lakes. Thus, both have similar water quality protection needs and should be given equal protection. Staff will not characterize L3 lakes as either "public" or "private," and recommend that references to "public" versus "private" L3 lakes be removed from the Water Quality Standards Rule and the Effluent Rule in a future rulemaking.

4. Guidelines for Wetland Classification

Guideline 4.1. Field assessments should be done in accordance with the U.S. Army Corps of Engineers "Wetlands Delineation Manual." If the candidate area meets the criteria for any wetland type noted in this manual, the candidate would be judged to be a classified wetland.

This manual can be found at the following Web site: (http://www.wes.army.mil/el/wetlands/pdfs/wlman87.pdf). Unlike the determination of Class P and C streams, the classification of wetlands may be done during any hydrologic conditions.

Field activities will generally begin with a visual inspection of the targeted water body at several randomly selected locations. If anecdotal information is given regarding locations of possible sites, then those sites should be included in the survey.

If access to the water body is to be made on private property, landowner or resident consent should be obtained prior to accessing the property, or a suitably restricted search warrant should be obtained by the department for its employees.

All assessment sites and wetland boundaries should be clearly marked on 1:24,000 (7.5 minute) USGS topographic quadrangle maps. Global Positioning System (GPS) coordinates and EPE (error of reading) of each site should be taken on-site and recorded in the field notes.

Narrative site assessments should be clearly recorded, either in electronic or written format, at each assessment site. This is to eliminate the risk of confusion between multiple site observations. Note any structures that may facilitate or obstruct re-propagation of aquatic life in the wetland.

A photographic record should be made of each site during the site assessment. Photographs should be catalogued in the field notes in a manner that indicates the site location, date, view orientation and what is being shown.

At a minimum, dissolved oxygen, pH, specific conductance, and temperature should be measured at each assessment site when possible and documented in the field notes. Sample collection should be consistent with the methods outlined in *Standard Methods for the Examination of Water & Wastewater, 20th Edition*, and any subsequent editions.

If possible, local landowners and residents should be interviewed regarding the history of the water body in question. Interviews are to be clearly recorded, either in electronic or written format. Persons interviewed should be identified by legal name and address in the field notes and written report.

Biological community sampling will focus on determining the presence or absence of hydric vegetation. Soil sampling will focus on determining the presence or absence of hydric soils. Hydrologic surveys should be conducted when possible to document evidence of inundation.

5. Guidelines for Determination of a Drought or Dry Period

The current definition for Class P streams requires only that the stream maintain flow during drought periods. The current definition for Class C streams requires that the stream maintain permanent pools that support aquatic life during dry periods. The following guidelines define the period under which field measurements will be made for both Class P and C determination.

A "drought" or "dry period" for the purposes of determining stream classification must meet all four of the guidelines below.

Guideline 5.1. Stream flow at the nearest USGS gauge (excluding gauges on the Missouri and Mississippi Rivers and those downstream of L2 lakes) with at least 30 years of record[2] is less than the 20th percentile of mean weekly streamflow.

This data may be obtained from the USGS Web site http://water.usgs.gov/cgi-bin/dailyMainW?map_type=dryd&state=mo. Include a copy of the station Web page including the data table at the bottom showing the percent exceedence (the 80% exceedence value is the 20th percentile flow value) in the final report.

Guideline 5.2. The watershed has received less than 75% of the normal precipitation over the preceding three (3) months as determined from at least thirty years of record.[3]

This data may be obtained from the Missouri Climate Center Web site: http://www.mcc.missouri.edu/monitoring/prcpdev2-90days.gif. Include a copy of the Web page in the final report.

Guideline 5.3. The watershed received no 24-hour rainfall totals in excess of 0.25" and no more than 0.5" total rainfall in the preceding two (2) weeks.

Guideline 5.4. The above flow and rainfall conditions occur between July 1 and September 30.

6. Guidelines for the Selection of Sites for Field Measurements for Determining Stream Classification

Stream classification guidelines should be applied as follows:

Guideline 6.1. For all candidate streams, the portion of the evaluated segment to which the criteria are applied, should be representative of the entire segment with respect to stream morphometry, substrate and geology.

[2] The name and location of the gauges in and near Missouri with at least 30 years of flow record are given in Appendix A.

[3] This criterion is likely to be met in about one year in six or seven, based upon an estimate that the probability of three consecutive months receiving less than 60% of mean precipitation at Columbia, Missouri, for April through October is 13% or about one year in eight. "Atlas of Missouri Ecoregions" Nigh and Schroeder, MDC, 2002, p.10.

Guideline 6.2. For Determination of Permanency of Flow (Class P)

- *If the candidate segment for classification is less than 0.5 miles in length, the entire length of the candidate segment should be evaluated.*
- *If the candidate segment to be evaluated for classification is 0.5 to 1 mile in length, at least 50% of the candidate segment should be evaluated.*
- *If the candidate segment to be evaluated for classification is greater than 1 mile in length, at least 0.5 miles plus 25% of the candidate segment distance in excess of one mile should be evaluated.*

Guideline 6.3. For Determination of Permanent Pools Supporting Aquatic Life (Class C)

- *Candidate segments should be no more than 0.5 miles in length. If reclassification is desired for a stream segment greater than 0.5 miles in length, separate applications should be submitted for each 0.5-mile segment.*
- *If the candidate segment has three or fewer pools, sample all pools.*
- *If the candidate segment has four to ten pools, sample four pools.*
- *If the candidate segment has 11-20 pools, sample 5 pools.*
- *If the candidate segment has greater than 20 pools, sample 6 pools.*

7. Guidelines for Permanently Flowing Streams, Class P

Field activities should begin with a visual inspection of the targeted water body at several representative locations.

If access to the water body is to be made on private property, landowner or resident consent should be obtained prior to accessing the property, or a suitably restricted search warrant should be obtained by the department for its employees.

The candidate segment should be clearly marked on 1:24,000 (7.5 minute) USGS topographic quadrangle maps. Global Positioning System (GPS) coordinates and EPE (error of measurement) of each site should be taken on-site and recorded in the field notes. Aerial photos may be included in addition to the topographic map.

Guideline 7.1. During the previously defined "drought" or "dry period," the stream segment evaluated should have visible surface flow for at least 70% of the segment length.

Guideline 7.2. During the previously defined "drought" or "dry period," if the flow in the stream is wholly from an anthropogenic source, the candidate segment should be at least 0.25 miles in length and the downstream end of the candidate segment should connect directly with the existing classified stream network.

Comment: The present definition of Class P waters provides no indication of what particular attribute(s) of flowing water place it in a different class than non-flowing pooled waters. One attribute is that it provides a continuous passageway for aquatic organisms. A second is that

flowing water is required by some forms of aquatic life. A third is that flowing water may maintain better water quality than nonflowing, pooled waters, which may stagnate.

During low flow conditions, some stream channels show surface flow in some locations but not in others. Where the stream bottom is an impervious surface such as bedrock, surface flows are visible but in areas of the channel where there are sizeable areas of gravel or other coarse substrate, all flow may be within the interstices and is hidden from view. Our choice of the 70% figure in the criterion is based on our opinion that during dry weather, the need for flow by certain forms of aquatic life and the maintenance of water quality have greater ecological significance than the need for a continuous zone of passage.

8. Guidelines for Streams with Permanent Pools in Dry Weather that Support Aquatic Life, Class C

If access to the water body is to be made on private property, landowner or resident consent should be obtained prior to accessing the property, or a suitably restricted search warrant should be obtained by the department for its employees.

Persons conducting biological sampling should, at a minimum, be rated as "Level Two" by the Missouri Volunteer Water Quality Monitoring Program, or must have knowledge and experience in biological sampling of streams at least commensurate with a "Level Two" rating. Those persons conducting biological monitoring that are not a Missouri Volunteer Water Quality Monitoring Program participant with at least Level Two rating, should provide their name, address, organization they represent, if any, and a summary of their education and experience that qualifies them for biological monitoring.

Prior to collection activities, a scientific collectors permit must be obtained from the Missouri Department of Conservation. (Required by 3 CSR 10-9.425) If federally protected species are likely to be encountered, contact the United States Fish & Wildlife Service (USFWS).

8.1. Guidelines for Consideration of Candidacy

Final determination of Class C status will be made by a multiagency committee composed of aquatic biologists. A stream segment that is proposed as a candidate for addition as a Class C stream should meet both the following criteria before this committee will review it[4]

Guideline 8.1.1. The thalweg[5] distance of each 0.5-mile segment evaluated should be either

- *20% pooled with each pool having a maximum depth of at least 1 foot or*
- *Pool frequency exceeds 5 pools with each pool having a maximum depth of at least 1 foot.*

[4] If the department believes that a candidate stream may fail to meet any of the biological guidelines in Section 8 (i.e., Guidelines 8.1.2., 8.2.1., 8.2.2., and 8.2.3.) due to water pollution, the department will conduct a water quality assessment of the candidate segment. If this assessment indicates this stream has water pollution that may impair the biological community, the stream can be re-evaluated for classification once the water pollution problem is corrected.

[5] The line within the stream channel that marks the deepest portion of the stream channel.

Guideline 8.1.2. Collection and field identification of aquatic invertebrates yields a diversity score of 7 or greater as calculated on the Stream Candidacy Field Data Sheet.

A Stream Candidacy Field Data Sheet should be filled out for each stream segment evaluated for Class C status. If the candidate segment does not meet these two criteria, no other fieldwork should be done and the field sheets should be submitted to the Department of Natural Resources. This segment is considered unable to meet the minimum criteria for a Class C stream.

8.2. Additional Field Studies and Guidelines Used by Multiagency Review Committee

If Guidelines 8.1.1 and 8.1.2 are met, additional field activities should begin with a visual inspection of the targeted water body at several representative locations. The number of pools sampled will be determined by Guideline 6.3. A Pool Survey Field Data Sheet and Aquatic Life Survey Field Data Sheet must be filled out for each pool surveyed.

The candidate segment and all pools sampled should be clearly marked on 1:24,000 (7.5 minute) USGS topographic quadrangle maps. Global Positioning System (GPS) coordinates and EPE (error of measurement) should be made at the upstream and downstream end of the candidate segment and the upstream and downstream end of each pool that is monitored, and recorded in the field notes. Aerial photos may be included in addition to the topographic map.

Narrative site assessments are to be clearly recorded, either in electronic or written format, at each pool sampled. Note any structures that may facilitate or obstruct re-propagation of aquatic life in the stream.

A photographic record should be made of each site during the site assessment. Photographs should include at least one photograph of each pool sampled and can include photos of observed or potential beneficial uses. Photographs should be catalogued in the field notes in a manner that indicates the site location, date, view orientation and what is being shown.

At a minimum, dissolved oxygen, pH, specific conductance, and water temperature should be measured at each assessment site when possible and documented in the field notes. Sample collection and analysis should be consistent with the methods outlined in *Standard Methods for the Examination of Water & Wastewater, 20th Edition,* and any subsequent editions.

If possible, streamside landowners and local residents should be interviewed regarding the history of the stream in question. A written record of the interview should accompany the other materials sent for review.

Field measurements will include physical measurements of pools and biological community sampling. Biological community sampling will focus on aquatic macroinvertebrates, and will include supplemental information on fish if they are present.

Macroinvertebrate sampling procedures should follow those given in Appendix B.

Macroinvertebrate samples should be hand picked, preserved in 70% alcohol and submitted to the Department of Natural Resources for review and evaluation.

The committee should judge the candidate segment to be a Class C stream if any of the following criteria are met. Guidelines 8.2.1 and 8.2.2 can be determined in the field. If neither of these guidelines are met, a macroinvertebrate sample must be submitted.

> *Guideline 8.2.1. Living Unionid Mussels present. Photo documentation required and mussels shall be immediately returned to the pool, unharmed.*
>
> *Guideline 8.2.2. At least two families of fish are present within the candidate segment or if only one family of fish is present, they average at least 20 individuals per pool sampled.*
>
> *Guideline 8.2.3. Aquatic macroinvertebrate diversity meets the criteria set forth in Appendix C.*

9.0 Submittal of Request for Classification Change

The department requests that results of field surveys and all requested data be submitted regardless of whether or not the candidate streams meets all necessary criteria. A request for classification of presently unclassified waters, or a request for a change in the classification status of presently classified waters can be made by submitting documentation that the candidate water meets the established criteria for the requested classification. This documentation should describe the exact nature of the request, a detailed legal description of the water body in question, and presentation of all field data, specimens collected and other evidence that the water body in question meets the criteria specified for the desired classification. **A separate report must be submitted for each candidate water body.** Supporting documentation for the report may consist of any or all of the following items: topographic maps, aerial photographs, documentation of any existing uses, transcripts of landowner/local resident interviews (either recorded or written), photocopies of all field notes & summaries, and photocopies of laboratory analyses.

A Microsoft compatible copy of the requested information is recommended but not required. Send the completed report and all supporting documentation for review and evaluation to:

> Missouri Department of Natural Resources
> Water Protection Program
> Water Quality Monitoring and Assessment Section
> P.O. Box 176
> Jefferson City, MO 65102-0176

The department will review the submitted material for accuracy, completeness and adequacy. The Missouri Department of Natural Resources, or any other partnering agency may perform Quality Assurance/Quality Control (QA/QC) procedures on any submitted material to ensure accuracy.

If the data in the report meets the established criteria, a recommendation to add the water in question may be made to the Missouri Clean Water Commission. If approved by the Commission, the change in classification will be proposed for addition to 10 CSR 20-7.031, Missouri's Water Quality Standards rule. Modifications will be incorporated into Missouri's Water Quality Standards through the triennial review process. All modifications approved by the Clean Water Commission will receive official comment from EPA Region 7 to ensure federal agreement with the recommendations.

10. Nature of Guidelines

These guidelines are not intended as a substitute for the professional judgement of staff members. These guidelines are intended to promote consistency in evaluating waters throughout the state, and to put the public on notice of the procedures generally employed by staff members in evaluating waters of the state. These guidelines only provide general guidance regarding the approach that the staff will take in developing recommendations, and the staff will make its recommendations on a case by case basis considering any and all relevant factors and procedures. In addition, this document is merely a reflection of the staff's procedures and is not intended to impact any commission rulemaking.

Appendix A.

Flow Gauging Stations In and Near Missouri With At Least 30 Years of Flow Record

Station No.	Station Name	Latitude	Longitude
5495000	Fox River at Wayland, MO	402333	913550
5496000	Wyaconda River above Canton, MO	400832	913355
5497000	North Fabius River at Monticello, MO	400630	914251
5498000	Middle Fabius River near Monticello, MO	400537	914408
5500000	South Fabius River near Taylor, MO	395349	913449
5501000	North River at Palmyra, MO	394906	913113
5502000	Bear Creek at Hannibal, MO	394043	912433
5503500	SALT RIVER NEAR HUNNEWELL, MO	394010	915415
5504800	South Fork Salt River above Santa Fe, MO	391934	915002
5505000	SOUTH FORK SALT RIVER AT SANTA FE, MO	392145	914905
5506000	YOUNGS CREEK NEAR MEXICO, MO	391840	915640
5506500	MIDDLE FORK SALT RIVER AT PARIS, MO	392901	920049
5506800	Elk Fork Salt River near Madison, MO	392605	921004
5507000	ELK FORK SALT RIVER NEAR PARIS, MO	392625	920005
5507500	SALT RIVER NEAR MONROE CITY, MO	393225	914020
5508000	Salt River near New London, MO	393644	912430
5514500	Cuivre River near Troy, MO	390059	905900
5587450	Mississippi River at Grafton, IL	385805	902542
5587500	MISSISSIPPI RIVER AT ALTON, IL	385306	901051
7010000	Mississippi River at St. Louis, MO	383744	901047
7010500	MARAMEC SPRING NEAR ST. JAMES, MO	375720	913157
7013000	Meramec River near Steelville, MO	375958	912139
7014500	Meramec River near Sullivan, MO	380930	910630
7019000	Meramec River near Eureka, MO	383020	903530
7015000	BOURBEUSE RIVER NEAR ST. JAMES MO	380200	913853
7015720	Bourbeuse River near High Gate, MO	380849	913450
7016500	Bourbeuse River at Union, MO	382645	905930
7017200	Big River at Irondale, MO	374948	904127
7018000	BIG RIVER NEAR DESOTO, MO	380720	904030
7018100	Big River near Richwoods, MO	380934	904222
7018500	Big River at Byrnesville, MO	382145	903905
7020500	Mississippi River at Chester, IL	375410	895110
7022000	Mississippi River at Thebes, IL	371300	892750
7021000	Castor River at Zalma, MO	370848	900432
7032000	Missisippi River at Memphis, TN		
7035000	Little St. Francis River at Fredericktown, MO	373333	901846
7037500	St. Francis River near Patterson, MO	371140	903012
7039500	St. Francis River at Wappapello, MO	365541	901555
7040000	St. Francis River at Fisk, MO	364650	901208
7041000	LITTLE RIVER DITCH 81 NEAR KENNETT, MO	361410	895858
7042000	LITTLE RIVER DITCH 1 NEAR KENNETT, MO	361409	895853
7042500	LITTLE RIVER DITCH 251 NEAR LILBOURN, MO.	363320	894012
7043000	CASTOR RIVER AT AQUILLA, MO	365708	895425
7043500	Little River Ditch no. 1 near Morehouse, MO	365003	894348
7044000	LITTLE RIVER DITCH 251 NEAR KENNETT, MO	361408	895845
7045000	LITTLE RIVER DITCH 66 NEAR KENNETT, MO	361409	895848
7045500	LITTLE RIVER DITCH 66A NEAR KENNETT, MO	361410	895845
7046000	LITTLE RIVER DITCH 259 NEAR KENNETT, MO	361408	895841
7077380	Cache River at Egypt, AR		
7077500	Cache River at Patterson, AR		
7077700	Bayou DeView at Morton, AR		

6806500	WEEPING WATER CREEK AT UNION, NE		
6807000	Missouri River at Nebraska City, NE		
6807000	Missouri River at Nebraska City, NE		
6810000	Nishnabotna River above Hamburg, IA		
6813000	TARKIO RIVER AT FAIRFAX, MO	402020	952432
6817500	NODAWAY RIVER NEAR BURLINGTON JCT, MO	402642	950519
6818000	Missouri River at St. Joseph, MO	394512	945128
6820500	Platte River near Agency, MO	394119	944215
6821150	Little Platte River at Smithville, MO	392317	943444
6819500	One Hundred and Two River at Maryville, MO	402045	944956
6891000	KANSAS RIVER AT LECOMPTON, KS		
6891500	WAKARUSA RIVER NEAR LAWRENCE, KS		
6892000	STRANGER CREEK NEAR TONGANOXIE, KS		
6892350	KANSAS RIVER AT DESOTO, KS		
6892500	KANSAS RIVER AT BONNER SPRINGS, KS		
6897000	East Fork Big Creek near Bethany, MO	401750	940136
6897500	Grand River near Gallatin, MO	395537	935633
6899000	WELDON RIVER AT MILL GROVE, MO	401835	933538
6899500	Thompson River at Trenton, MO	400446	933839
6900000	MEDICINE CREEK NEAR GALT, MO	400745	932145
6901500	Locust Creek near Linneus, MO	395345	931410
6902000	Grand River near Sumner, MO	393825	931625
6903400	Chariton River near Chariton, IA		
6903700	South Fork Chariton River near Promise City, IA		
6903900	Chariton River near Rathbun, IA		
6904500	Chariton River at Novinger, MO	401405	924114
6905500	Chariton River near Prairie Hill, MO	393225	924723
6906000	Mussel Fork near Musselfork, MO	393126	925659
6906200	East Fork Little Chariton River near Macon, MO	394459	923103
6906300	East Fork Little Chariton River near Huntsville, MO	392718	923407
6915000	BIG BULL CREEK NEAR HILLSDALE, KS		
6916000	MARAIS DES CYGNES RIVER AT TRADING POST, KS		
6916500	BIG SUGAR CREEK AT FARLINVILLE, KS		
6916600	MARAIS DES CYGNES RIVER NEAR KS-MO STATE LINE, KS		
6917000	L OSAGE RIVER AT FULTON, KS		
6917380	MARMATON RIVER NEAR MARMATON, KS		
6917500	MARMATON RIVER NEAR FORT SCOTT, KS		
6918440	Sac River near Dadeville, MO	372635	934105
6918460	Turnback Creek above Greenfield, MO	372409	934806
6918740	Little Sac River near Morrisville, MO	372858	932907
6919000	Sac River near Stockton, MO	374151	934543
6919500	Cedar Creek near Pleasant View, MO	375003	935231
6921070	Pomme de Terre River near Polk, MO	374056	932212
6921200	Lindley Creek near Polk, MO	374502	931558
6921350	Pomme de Terre River near Hermitage, MO	375420	931945
6921500	POMME DE TERRE RIVER AT HERMITAGE, MO	375645	931835
6922000	SOUTH GRAND RIVER NEAR BROWNINGTON, MO	381549	934252
6922500	Osage River at Warsaw, MO	381440	932310
6923500	BENNETT SPRING AT BENNETT SPRINGS, MO	374303	925126
6924000	NIANGUA RIVER NEAR DECATURVILLE, MO	375618	925037
6926000	Osage River near Bagnell, MO	381129	923626
6926500	OSAGE RIVER NEAR ST. THOMAS, MO	382020	921334
6928000	Gasconade River near Hazelgreen, MO	374533	922706
6928500	GASCONADE RIVER NEAR WAYNESVILLE, MO	375220	921337
6930000	Big Piney River near Big Piney, MO	373956	920301
6932000	Little Piney Creek at Newburg, MO	375435	915412
6933500	Gasconade River at Jerome, MO	375547	915838
6934000	Gasconade River near Rich Fountain, MO	382320	914915

6893000	Missouri River at Kansas City, MO	390643	943516
6893300	INDIAN CREEK AT OVERLAND PARK, KS	385630	944010
6893500	Blue River at Kansas City, MO	385726	943331
6893560	Brush Creek at Kansas City, MO	390222.7	943504.01
6893793	L. Blue River below Longview Dam at Kansas City, MO	385526	942805
6894000	Little Blue River near Lake City, MO	390602	941801
6895500	Missouri River at Waverly, MO	391254	933054
6909000	Missouri River at Boonville, MO	385842	924513
6910750	Moreau River near Jefferson City, MO	383144	921131
6907000	LAMINE RIVER AT CLIFTON CITY, MO	384526	930120
6908000	Blackwater River at Blue Lick, MO	385932	931148
6934500	Missouri River at Hermann, MO	384236	912621
7048000	WEST FORK WHITE RIVER AT GREENLAND, AR		
7048600	White River near Fayetteville, AR		
7049000	War Eagle Creek near Hindsville, AR		
7050000	WHITE RIVER AT BEAVER, AR		
7050500	Kings River near Berryville, AR		
7050700	James River near Springfield, MO	370900	931212
7052000	Wilson Creek at Scenic Drive in Springfield, MO	371112	931952
7052100	Wilson Creek near Springfield, MO	371006	932214
7052160	Wilson Creek near Battlefield, MO	370704	932414
7052250	James River near Boaz, MO	370025	932150
7052500	James River at Galena, MO	364819	932741
7053500	WHITE RIVER NEAR BRANSON, MO	363551	931742
7057500	North Fork River near Tecumseh, MO	363722	921453
7058000	Bryant Creek near Tecumseh, MO	363733	921816
7061300	EAST FORK BLACK RIVER AT LESTERVILLE, MO	372703	904938
7061500	Black River near Annapolis, MO	372010	904719
7062500	BLACK RIVER AT LEEPER, MO	370332	904112
7063000	Black River at Poplar Bluff, MO	364534	902317
7065000	ROUND SPRING AT ROUND SPRING, MO	371657	912427
7065500	ALLEY SPRING AT ALLEY, MO	370914	912629
7066000	Jacks Fork at Eminence, MO	370918	912131
7066500	CURRENT RIVER NEAR EMINENCE, MO	371102	911530
7067000	Current River at Van Buren, MO	365929	910053
7067500	BIG SPRING NEAR VAN BUREN, MO	365705	905936
7068000	Current River at Doniphan, MO	363719	905051
7069000	Black River at Pocahontas, AR		
7072500	Black River at Black Rock, AR		
7069500	Spring River at Imboden, AR		
7071000	GREER SPRING AT GREER, MO	364711	912053
7071500	Eleven Point River near Bardley, MO	363855	911203
7185000	Neosho River near Commerce, OK		
7186000	Spring River near Waco, MO	371444	943358
7187000	Shoal Creek above Joplin, MO	370123	943058
7189000	Elk River near Tiff City, MO	363753	943512

Appendix B

Macroinvertebrate Sampling Methods

Collection and Preservation of Samples

Equipment Needed:

Bottom Aquatic Kick Net with 500 micron mesh net
Nitex bag with 500 micron mesh net
Large white pan
70% alcohol
Labels
Forceps
Sample jars

For the purpose of this document Missouri has two stream types:

1) Streams with riffle/pool predominance are primarily found in the Ozark aquatic region of Missouri, but are also found in some portions of the Prairie region (Missouri Resource Assessment Partnership, 2000). A typical and characteristic feature of a riffle/pool stream type is a repeated and regular frequency of riffles. Riffles typically form every 7-10 stream widths. The three predominant habitats sampled for riffle/pool streams are: a) flowing water over coarse substrate; b) non-flowing water over depositional substrate; and c) rootmat substrate.

2) Streams with glide/pool predominance are found in the Prairie and Mississippi Alluvial Plains aquatic regions of Missouri (Missouri Resource Assessment Partnership, 2000). Glide/pool stream types generally have a repeated and predictable meander sequence. Pools typically form immediately after a bend. The three predominant habitats sampled for glide/pool streams are: a) non-flowing water over depositional substrate; b) large woody debris substrate; and c) rootmat substrate.

Representative organisms (Appendix C: Tables C-1, C-2, and C-3) from each major habitat are collected, preserved, and recorded separately to provide the ability to factor out habitat differences between sites. This will enhance comparisons involving streams where major habitats may be missing. As each habitat sample is collected and voucher organisms are preserved, a label is inserted in the sample jar stating the sampling location, date and habitat. Samples are preserved with 70% alcohol. An external sample label with sample identification number and habitat should also be placed on the sample jar.

Sampling Riffle/Pool Predominant Streams

Flowing water coarse substrate samples are not collected in streams that are pooled.

Non-flowing water depositional substrate samples are taken from depositional areas, formed when water current drops to low velocities, resulting in deposits of sediment and particulate organic matter that are no longer held in suspension. Because water velocities in these areas are not usually discernable with the naked eye, the water is categorized as non-flowing. Six collections from a variety of depositional depths and microhabitats (i.e., backwater, nearshore, forewaters, in channel pools, etc.) are collected with a bottom aquatic kick net with a 500 x 500 micron mesh bag. Each sample is taken from an approximately one-square meter area of substrate using a traveling kick method. To do this, the substrate is disturbed by the collector's feet to a depth of 15-25 cm while sweeping the net back and forth immediately over the substrate to collect organisms that are suspended in the water column. Each net sample should be examined for voucher organisms, which are then picked up with forceps and preserved in a labeled sample vial.

Rootmat substrate samples are submerged roots from terrestrial vegetation, which are important habitat and sources of refuge for aquatic organisms. Rootmat is best defined as the immersed portion of fine fibrous roots of woody vegetation that are found along the bank. Depending on the amount of rootmat present, collections are made from six distinctly different areas along the sampling reach. Each collection is made from approximately one meter of shoreline exhibiting good quality rootmat. Sampling is accomplished by using a bottom aquatic kick net with a 500 x 500 micron mesh bag. If current is present, the net is placed so that the substrate can be disturbed by a kicking action which causes the organisms to be swept into the net. If no current is present, the net is placed under the substrate and shaken vigorously, causing any clinging organisms to fall into the net. Each net sample should be examined for voucher organisms, which are then picked up with forceps and preserved in a labeled sample vial.

Sampling Glide/Pool Predominant Streams

Non-flowing water depositional substrate samples are taken from depositional areas, formed when water current drops to low velocities, resulting in deposits of sediment and particulate organic matter that are no longer held in suspension. Because water velocities in these areas are not usually discernable with the naked eye, the water is categorized as non-flowing. Six collections from a variety of depositional depths and microhabitats (i.e., backwater, nearshore, forewaters, in channel pools, etc.) are collected with a bottom aquatic kick net with a 500 x 500 micron mesh bag. Each sample is taken from an approximately one-square meter area of substrate using a traveling kick method. To do this, the substrate is disturbed by the collector's feet to a depth of 15-25 cm while sweeping the net back and forth immediately over the substrate to collect organisms that are suspended in the water column. Each net sample should be examined for voucher organisms, which are then picked up with forceps and preserved in a labeled sample vial.

Large woody debris substrates are submerged portions of large logs as well as tree branches greater than one inch in diameter. A composite of twelve collections is made from different pieces of woody debris. The pieces of woody debris selected should represent a variety of conditioned wood types, sizes, water depths and velocities. The sampling area on each piece of woody debris is an area of approximately 400-600 square centimeters. Organisms associated with the large woody debris and associated growths of periphyton or moss are collected by using a hand scrub brush and a nitex bag with dimensions of 44 centimeters wide by 50 centimeters deep. The bag is made by folding a 46 centimeters wide by 102 centimeter long piece of 500 x 500 micron mesh nitex cloth in half. The sides are folded over 10 centimeters and sewn together. Each edge at the top is also folded and sewn for extra strength. The sampling of woody debris usually requires two people. When possible large woody debris is gently lifted off the stream bottom and slid into the bag by one individual while the other individual holds the bag open. The wood and bag can then be tilted to vertical after which the first individual holds and brushes the wood while the second individual continues to hold the bag open. Woody debris too large to lift can be sampled using different strategies depending upon water velocity. Both strategies require one individual to hold the bag opening open while molding one side of the bag to fit the contour of the wood. If water current is present, the bag is placed immediately downstream from the sampling area and the current carries organisms into the bag. When there is no natural current available, an artificial current can be created by repeatedly sweeping the brush along the log only in the direction of the bag opening. When the twelve collections have been made the sample is processed by concentrating the material into one corner of the bag by splashing the outside of the bag with water. The corner of the bag and concentrated material can then be grasped and inverted into a pan to look for voucher organisms, which are then picked up with forceps and preserved in a labeled sample vial.

Rootmat substrate samples are submerged roots from terrestrial vegetation, which are important habitat and sources of refuge for aquatic organisms. Rootmat is best defined as the immersed portion of fine fibrous roots of woody vegetation that are found along the bank. Depending on the amount of rootmat present collections are made from six distinctly different areas along the sampling reach. Each collection is made from approximately one meter of shoreline exhibiting good quality rootmat. Sampling is accomplished by using a bottom aquatic kick net with a 500 x 500 micron mesh bag. If current is present, the net is placed so that the substrate can be disturbed by a kicking action which causes the organisms to be swept into the net. If no current is present, the net is placed under the substrate and shaken vigorously, causing any clinging organisms to fall into the net. Each net sample should be examined for voucher organisms, which are then picked up with forceps and preserved in a labeled sample vial.

Appendix C
Macroinvertebrate Indicators of Class C streams

At the request of the Water Protection Program, the Environmental Services Program, Water Quality Monitoring Section, Aquatic Bioassessment Unit has developed a list of macroinvertebrate taxa and criteria for Class C streams of Missouri Prairie and Ozark ecoregions. The purpose of the taxa list and criteria are to better evaluate any currently unclassified streams in Missouri as to their potential for classification as Class C in the Missouri Water Quality Standards. This memorandum provides the methodology by which the expected Class C streams macroinvertebrate taxa list was developed.

The Aquatic Bioassessment Unit (ABU) database currently consists of 760,083 identified macroinvertebrate taxa from 708 stream stations in 75 Missouri counties. The dates of record are from September 1994 through April 2003. Each of the stream stations has descriptive information, including the stream class designations for Class P (permanent flow), Class C (maintains permanent pools in times of dry weather), and streams that are designated by the ABU as Class U (unclassified streams).

The life cycles and ecology of many macroinvertebrates are not completely known, therefore it is difficult to determine from published literature which stream macroinvertebrate taxa in Missouri require permanent flow or permanent pools. The first step in the process to determine which taxa could be expected to require permanent pools was to query macroinvertebrate information from the ABU database based upon Class C and Class P parameters. In addition, the data was sorted by three geographical and stream type criteria and was filtered by fall data only. This allows a better prediction of macroinvertebrate taxa at any potential Class C stream location during the time period that is designated for Class C determinations. The three categories are Prairie – glide/pool streams (P-GP), Prairie – riffle/pool streams (P-RP), and Ozark – riffle/pool (O-RP) streams. The number of Class C and Class P streams used in each category were P-GP = 25 Class C and 40 Class P, P-RP = 21 Class C and 18 Class P, and O-RP=13 Class C and 170 Class P. In addition, only macroinvertebrate taxa from pool related habitats were included in the query. For GP streams this includes all potential habitats (depositional, large woody debris, and rootmat) as listed in the Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure (MDNR 2003). For RP streams only depositional and rootmat habitats were included because Class C streams that are evaluated during drought will most likely be pooled and will not have the third potential habitat of flowing water over coarse substrate (MDNR 2003). From the list of all taxa that was generated for the three categories, only taxa that were present at both Class C and Class P streams were selected as candidates. These lists of candidates are taxa that are found in permanent streams of Missouri. The taxonomic level of identification is the lowest practical level that is listed in the Taxonomic Levels for Macroinvertebrate Identification Standard Operating Procedure (MDNR 2001).

The next series of steps was designed to narrow the list of candidate taxa that are found in permanent streams to a list of taxa that require permanent streams. The reason for this distinction is the fact that taxa adapted to a life cycle that can withstand total drying of the stream are also found in permanent streams. Other taxa found in permanent streams are limited to streams that have permanent water. Although the literature concerning this topic is not extensive there are several good sources of information that deal with macroinvertebrate taxa that require permanent water in streams. Rabeni and Wallace (1998) provide information about macroinvertebrate taxa from 15 sites in the Ozarks that range from permanent to intermittent. Ohio (OEPA 2002) has done considerable work on the prediction of macroinvertebrate taxa in headwater streams. Wiggins et al. (1980) provides valuable information concerning the ability and strategies of specific invertebrates in surviving complete drying of semi-permanent waters.

The first step was to select taxa from the Missouri candidate list reported to be taxa that require permanent streams or streams with permanent pools (Rabeni and Wallace, 1998; OEPA, 2002). Because neither document was considered all-inclusive for Missouri, the final step was the use of best professional judgement by three aquatic biologists in the ABU. Additional taxa were selected from the candidate list based upon ecological information or aquatic life stages that were one year or longer. A selection of the final macroinvertebrate taxa list of Class C Missouri streams can be found in Appendix A for P-G/P, Appendix B for P-R/P, and Appendix C for O-R/P. The expected number of Class C taxa are P-GP = 23 taxa, P-RP = 29 taxa, and O-RP = 30 taxa.

Because the Class C expected taxa list is a composite of information from many streams, the next step determines the criteria that any one Class C stream could pass. To determine this criteria, existing Class C streams within the appropriate category were queried for the number of expected taxa actually present during past MDNR sampling. In order to have sufficient data, all streams were included, including streams that have varying degrees of anthropogenic impacts. The highest value reached by any stream in its respective category was an observed /expected ratio of 12/23 taxa or 52% for the category P-GP, 15/29 taxa or 52% for the category P-RP, and 16/30 taxa or 53% for the category O-RP. Assuming all Class C streams used in the calculation are accurately classified, the numeric criterion for each category becomes the lowest value for each category. Those value are P-GP = 2 taxa, P-RP = 3 taxa, and O-RP = 4 taxa.

As mentioned above, the criterion was calculated with varying degrees of human influence. Streams that fall into the lower 25th percentile of the Class C stream criteria may have natural or human influenced limitations for aquatic fauna. The 25th percentile value could operate as a value at which the candidate Class C stream is evaluated for habitat, water quality, or other influences. The 25th percentile values for candidate Class C streams are P-GP = 5 or 22%, P-RP = 8 or 28%, and O-RP = 8 or 27%.

These macroinvertebrate criteria used in combination with the presence of fish, mussels, and/or aquatic plants could provide a more definitive way of determining if a candidate Class C stream supports aquatic life that requires permanent pools.

Literature Cited

Missouri Department of Natural Resources. 2003. Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure. MDNR-FSS-030. Missouri Department of Natural Resources, Environmental Services Program, P.O. Box 176, Jefferson City, Missouri 65102. 24 pp.

Missouri Department of Natural Resources. 2001. Taxonomic Levels for Macroinvertebrate Identification. MDNR-WQMS-209. Missouri Department of Natural Resources, Environmental Services Program, P.O. Box 176, Jefferson City, Missouri 65102. 32 pp.

Ohio Environmental Protection Agency. 2002. Technical Report: Ohio's Primary Headwater Streams – Macroinvertebrate Assemblages. Ohio Environmental Protection Agency, Division of Surface Water, Columbus, Ohio. 25 pp.

Rabeni, C.F. and G.S. Wallace. 1998. The influence of flow variation on the ability to evaluate the biological health of headwater streams. Proceeding of the HeadWater '98 Conference, Merano, Italy. Hydrology, Water Resources and Ecology in Headwaters IAHS Publication no. 248. Pgs. 411-417.

Wiggins, G.B., R.S. Mackay, and I.M. Smith. 1980. Evolutionary and ecological strategies of animals in annual temporary pools. Archives of Hydrobiologia Supplement 58: 97-206.

Class C Macroinvertebrate Taxa
Prairie – glide/pool streams

	Taxa-Code	Taxa	Class C	Class P	Ohio-Class II	Rabeni	MDNR BPJ
Coleoptera	6810	Dubiraphia	X	X		X	X
Coleoptera	6890	Stenelmis	X	X		X	X
Crustacea	511	Hyalella azteca	X	X	X	X	X
Crustacea	757	Orconectes luteus	X	X			X
Crustacea	773	Orconectes virilis	X	X			X
Crustacea	651	Palaemonetes kadiakensis	X	X			X
Ephemeroptera	1471	Baetisca lacustris	X	X			X
Ephemeroptera	1128	Isonychia rufa	X	X			X
Ephemeroptera	1269	Stenonema terminatum	X	X			X
Ephemeroptera	1390	Tricorythodes	X	X		X	X
Ephemeroptera	1650	Hexagenia	X	X			X
Megaloptera	7510	Sialis	X	X			X
Megaloptera	7560	Corydalus	X	X			X
Odonata	2010	Calopteryx	X	X			X
Odonata	2020	Hetaerina	X	X			X
Odonata	2353	Boyeria	X	X			X
Odonata	2160	Enallagma	X	X		X	X
Odonata	2361	Nasiaeschna pentacantha	X	X			X
Odonata	2460	Gomphus	X	X			X
Odonata	2660	Macromia	X	X			X
Odonata	2730	Somatochlora	X	X	X		X
Trichoptera	5130	Cheumatopsyche	X	X		X	X
Trichoptera	5160	Hydropsyche	X	X			X
Total		23					

Class C Macroinvertebrate Taxa
Prairie – riffle/pool streams

	Taxa-Code	Taxa	Class C	Class P	Ohio-Class II	Rabeni	MDNR BPJ
Coleoptera	6810	Dubiraphia	X	X		X	X
Coleoptera	6851	Macronychus glabratus	X	X			X
Coleoptera	6721	Psephenus herricki	X	X			X
Coleoptera	6890	Stenelmis	X	X		X	X
Crustacea	511	Hyalella azteca	X	X	X	X	X
Crustacea	757	Orconectes luteus	X	X			X
Crustacea	773	Orconectes virilis	X	X			X
Crustacea	651	Palaemonetes kadiakensis	X	X			X
Ephemeroptera	1120	Isonychia	X	X			X
Ephemeroptera	1128	Isonychia rufa	X	X			X
Ephemeroptera	1269	Stenonema terminatum	X	X			X
Ephemeroptera	1390	Tricorythodes	X	X		X	X
Ephemeroptera	1650	Hexagenia	X	X			X
Megaloptera	7510	Sialis	X	X			X
Megaloptera	7560	Corydalus	X	X			X
Odonata	2010	Calopteryx	X	X			X
Odonata	2020	Hetaerina	X	X			X
Odonata	2160	Enallagma	X	X		X	X
Odonata	2351	Basiaeschna janata	X	X			X
Odonata	2353	Boyeria	X	X			X
Odonata	2361	Nasiaeschna pentacantha	X	X			X
Odonata	2460	Gomphus	X	X			X
Odonata	2660	Macromia	X	X			X
Odonata	2730	Somatochlora	X	X	X		X
Trichoptera	5130	Cheumatopsyche	X	X		X	X
Trichoptera	5030	Chimarra	X	X		X	X
Trichoptera	5860	Helicopsyche	X	X		X	X
Trichoptera	5160	Hydropsyche	X	X			X
Trichoptera	5660	Pycnopsyche	X	X			X
Total		29					

Class C Macroinvertebrate Taxa
Ozark – riffle/pool streams

	Taxa-Code	Taxa	Class C	Class P	Ohio-Class II	Rabeni	MDNR BPJ
Coleoptera	6810	Dubiraphia	X	X		X	X
Coleoptera	6726	Ectopria nervosa	X	X			X
Coleoptera	6851	Macronychus glabratus	X	X			X
Coleoptera	6860	Microcylloepus pusillus	X	X			X
Coleoptera	6721	Psephenus herricki	X	X			X
Coleoptera	6890	Stenelmis	X	X		X	X
Crustacea	511	Hyalella azteca	X	X	X	X	X
Crustacea	757	Orconectes luteus	X	X			X
Crustacea	760	Orconectes medius	X	X			X
Crustacea	773	Orconectes virilis	X	X			X
Ephemeroptera	1340	Eurylophella	X	X			X
Ephemeroptera	1268	Stenonema pulchellum	X	X		X	X
Ephemeroptera	1390	Tricorythodes	X	X		X	X
Ephemeroptera	1650	Hexagenia	X	X			X
Megaloptera	7510	Sialis	X	X			X
Odonata	2010	Calopteryx	X	X			X
Odonata	2160	Enallagma	X	X		X	X
Odonata	2351	Basiaeschna janata	X	X			X
Odonata	2353	Boyeria	X	X			X
Odonata	2361	Nasiaeschna pentacantha	X	X			X
Odonata	2460	Gomphus	X	X			X
Odonata	2491	Hagenius brevistylus	X	X			X
Odonata	2660	Macromia	X	X			X
Odonata	2730	Somatochlora	X	X	X		X
Odonata	2551	Stylogomphus albistylus	X	X			X
Plecoptera	3510	Acroneuria	X	X	X	X	X
Trichoptera	5130	Cheumatopsyche	X	X		X	X
Trichoptera	5030	Chimarra	X	X		X	X
Trichoptera	5860	Helicopsyche	X	X		X	X
Trichoptera	5160	Hydropsyche	X	X			X
Total		30					

Pool Survey Field Data Sheet

(A separate data sheet must be completed for each pool)

Stream Name:	Location:
Site ID:	Description:
Date:	
Personnel:	
Weather Now:	Upstream Pool Coordinates: (UGS 84, ddd.ddddd)
Weather past 24 hours:	Downstream Pool Coordinates: (UGS 84, ddd.ddddd)
Weather past 7 days:	Photo Ids:

Pool Morphology:

Width (ft):	Substrate:
Depth (ft):	Channelization?:
Length (ft):	Dam or other impediments to flow?:

Local Land Use:

% Forest	% Hayfield	% Row Crops	% Grazing	% Animal Confinement
% Urban / Commercial	% Urban / Industrial	% Suburban / Residential	% Suburban / Commercial	% Other:

Potential Water Sources:

☐ spring fed	☐ runoff	☐ effluent	☐ other:	Describe:

Riparian Zone:

% Trees:	% Shrub:	% Grass:	% Bare:	% Row crops:

Aquatic Vegetation in pool:

% Rooted emergent:	% Rooted submergent:	% Rooted floating:	% Free floating:	% Floating algae:	% Attached algae:

Water Chemistry: (if additional tests are done, attach results separately)

Temp:	Spec Cond:	DO:	pH:	Turbidity:

Human Disturbance: (Auto parking, footpaths, campsites, fishing tackle, ATVs, gravel mining, etc.)

Signs of Livestock Use: (fences, footprints, manure, etc.)

Description of Pool Conditions: (odors, surface sheens, discoloration, bottom deposits, trash)

Aquatic Life Survey Field Data Sheet

(A separate data sheet must be completed for each pool)

Unionid Mussel Field Data

Live Specimens: ☐ Yes ☐ No	Weathered Shell Material: ☐ Yes ☐ No	Do not collect any mussel specimens!
Photo Ids:		

Fish Collection Field Data (use additional sheets if necessary)

Visual Identification: ☐ Yes ☐ No	Seining: ☐ Yes ☐ No	Electrofishing: ☐ Yes ☐ No
Type (Family name)		Number

Macroinvertebrate Collection Field Data (use additional sheets if necessary)

Specimens of macroinvertebrates must be preserved & submitted to DNR for verification	Identified by:

	Number per Habitat Type:		
Taxa Name	Woody Debris	Rootmat	Depositional

Stream Candidacy Field Data Sheet

Only one Stream Candidacy Field Data Sheet is needed per segment requested for classification

Stream Name:	Location:
Date:	
Personnel:	
Upstream Stream Coordinates: (UGS 84, ddd.ddddd)	Upstream Legal Description:
Downstream Stream Coordinates: (UGS 84, ddd.ddddd)	Downstream Legal Description:

Criterion 1:

Pool #	Maximum Depth (ft)	Pool Length (ft)

Number of Pools with depths greater than 1ft = _____

Total length of pools with depths greater than 1ft = _____

Total length of stream requested for classification = _____

Percent of stream length pooled (total pool length / total stream length) _____

Criterion 2:

Group 1 Taxa	Present	Group 2 Taxa	Present	Group 3 Taxa	Present
Ephemeroptera		Riffle Beetles		Amphipods	
Plecoptera		Crawfish		Isopods	
Tricoptera		Dragonfly larvae		Damselfly larvae	
Megaloptera		Alderfly larvae		Other beetles	
Water Pennies				Aquatic worms	
				Snails	
				Diptera (other than Chironomids)	

Taxa Scores:

Number of Group 1 taxa represented x3 =		Number of Group 2 taxa represented x2 =		Number of Group 3 taxa represented x1 =		Sum of taxa scores:	